



WATER PURIFICATION

Subject: Science | Current: 2010 | Grade: 9-12

Day: 1 of 3

1 Purpose

Describe safe drinking water precautions and to create an emergency plan to be undertaken in the event of a natural disaster.

2 Duration

50 Minutes

3 Additional Topics

Water Pollution, Natural Disasters, and Health Issues

4 Objectives

At the conclusion of this lesson, students will be able to:

- Explain the reasons why safe drinking water is important.
- Discuss the effects of various disease symptoms caused by drinking unsafe water.
- Create a precaution plan for water safety in the event of a natural disaster.

5 Standards Addressed

SCIENCE

ENVIRONMENTAL SCIENCE

Understand and describe if a disaster occurs – such as flood or fire – the damaged ecosystem is likely to recover in stages that eventually result in a system similar to the original one.

ENV.1.2

Recognize and explain the amount of life any environment can support is limited by the available energy, water, oxygen, and minerals, and by the ability of ecosystems to recycle organic materials from the remains of dead organisms.

ENV.1.14



Identify natural Earth hazards, such as earthquakes and hurricanes, and identify the regions in which they occur as well as the short-term and long-term effects on the environment and on people.

ENV.1.33

EARTH AND SPACE SCIENCE

Investigate the causes of severe weather and propose appropriate safety measures that can be taken in the event of severe weather.

ES.1.16

HEALTH & WELLNESS

Examine how the environment and health are connected.

HW.1.3

Indiana Department of Education. (n.d.). Indiana Standards and Resources: Sciences: Environmental Science and Earth Space Science; Health & Wellness. Retrieved from <http://dc.doe.in.gov/Standards/AcademicStandards/StandardSearch.aspx>

6 Vocabulary

----- These terms are included in the lesson plan:

- **Dehydration:** The abnormal loss of water from the body.
- **E. Coli:** A type of bacteria normally found in the human intestinal tract.
- **Typhoid:** An infectious disease characterized by intestinal inflammation caused by the typhoid bacterium usually introduced with food or drink.
- **Cholera:** An acute infectious disease of the small intestine characterized by diarrhea, vomiting, muscle cramps, and severe dehydration.

7 Materials

----- Materials to aide the lesson plan include:

- Hurricane Katrina Video - URL at end of lesson plan.
- Classroom computer with projector
- Peer and Self-Assessment Evaluation



8 Methods & Procedures

The lesson plan's course is as follows:

A. Introduction

Water plays an essential role in the functioning of everyday life from drinking and cooking to recreational uses. Of equal importance is its vitality in the operation of the human body. It is the most common substance on earth in addition to the most abundant substance in the human body. Although it is possible for humans to survive up to six weeks without food, they can only survive one week or so without drinking clean water. The amount of water needed per person each day varies from person to person, based on a variety of factors including exposure to extreme temperatures and strenuous work conditions. In general, however, most people need 8-10 cups of water daily.

The average adult loses about 10 cups of water each day through perspiration, the kidney/bladder system, bowel movements, and the respiratory system. The human body does not store an extra supply of water for times when the human body may need more, such as in the case of a natural disaster. The signs and symptoms of dehydration are: being thirsty and a decrease in urine output. As the length of time increases without water, the body starts to have: dry mouth, perspiration ceases, muscle cramps begin, and nausea and vomiting occur. With severe dehydration, confusion and weakness will occur, and the brain and organs receive less blood, until finally the body enters into to a coma due to organ failure.

Despite the symptoms produced from dehydration, the cost of drinking contaminated water after a natural disaster could be even more catastrophic in a shorter period. In general, there are many water quality regulations in place to help ensure drinking water is safe. Even then, some microbes and contaminants pose a threat. In the event of a natural disaster, water can be contaminated with various microbes, bacteria, viruses, sewage contaminants, and toxic chemicals leaching. Consuming contaminated water can have detrimental side effects including vomiting, diarrhea, and possibly death.

B. Development

After the introduction, the class will watch a brief video clip featuring footage from Hurricane Katrina - URL at end of lesson plan.

As students are watching the video, have them think about how the residents were impacted in terms of water use.

- What did the residents do for drinking water before help arrived?
- What other daily aspects of their lives were affected by the lack of safe water?



C. Independent Practice

Students will get into groups of four to devise an emergency plan for their group in the event of a natural disaster. Remind students about the average amount of drinking water needed daily per person. Students must consider:

- The items they would include in the emergency kit and explain why.
- The practicality of the items they have included.
- The ease the items can be transported in the event of an emergency.

Students should be given approximately 25 minutes to complete this activity.

D. Practice

Each group will present their emergency plan to the class and explain why they chose each of the items. To facilitate discussion, the teacher may ask the following questions:

- What is the cost of each item?
- In the event of the emergency, is it possible to carry the emergency kit?
- Are the items you have proposed practical for every family to purchase?
- Should the government mandate or provide each family with an emergency kit?
- In what ways are local towns, cities, and schools prepared in the event of a natural disaster?

E. Accommodations (Differentiated Instruction)

Some students may not be aware of the costs of materials they include in their emergency kit. Catalogs and price lists should be easily available for their use. Students may be randomly assigned to groups, or the teacher may select the groups based on prior knowledge of water purification and the important role water plays in sustaining human life. Students who may not have this prior knowledge may need to work directly with the teacher to gain the background needed for the activity. For high ability/gifted students who need more challenge, the activity could be modified. In addition making the generic emergency kit, these students may want to consider what specific items might be needed under special circumstances, e.g. if there is a baby in the family, if there is a person who is visually impaired, etc.



F. Checking for Understanding

- Students will be asked to describe the health effects of dehydration.
- Students will be asked to determine items necessary in the event of a disaster.
- Students will be asked to identify contaminants in water after natural disasters.

G. Closure

Careers Involved in Water Purification:

- U.S Geological Survey or Agricultural Research Service
- U.S. Bureau of Reclamation
- Bureau of Land Management
- U.S. Army Corps of Engineers
- U.S. Forest Service
- Natural Resources Conservation Services
- U.S. Environmental Protection Agency
- URLs included at end of lesson plan

9 Evaluation

Students will be evaluated by their individual role in the creation of the emergency plans and kits and in the group discussion via the Self and Peer Assessment Rubric.

10 Teacher Reflection

To be completed by teacher following the lesson.



1 Media & Resources

----- Websites and Video included throughout lesson plan:

- <http://www.ynhh.org/online/nutrition/advisor/water.html>
- <http://www.medicinenet.com/dehydration/page2.htm>
- Hurricane Katrina – You Must Watch This - http://www.youtube.com/watch?v=IbLL_rXpdu8&feature=related
- U.S Geological Survey or Agricultural Research Service – <http://www.usgs.gov>
- U.S. Bureau of Reclamation – <http://www.usbr.gov/>
- Bureau of Land Management – <http://www.blm.gov/>
- U.S. Army Corps of Engineers – <http://www.usace.army.mil/>
- U.S. Forest Service – <http://www.fs.fed.us/>
- Natural Resources Conservation Services – <http://www.nrcs.usda.gov/>
- U.S. Environmental Protection Agency – <http://www.epa.gov/>
- <http://www.ready.gov>
- sPeer and Self-Assessment Evaluation

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SELF AND PEER EVALUATION

Instructions: Read each description well and think about how you and your group members performed each of the requirements. Score yourself under the "Your Points" category and write your partners names in each of the partner boxes and provide a score for each of the partners. I will then calculate a score for you, based on my observations, in the "My Points" category.

Area	Superior 4 Pts	Good 3 Pts	Fair 2 Pts	Poor 1 Pt	Your Points	Partner #1	Partner #2	Partner #3	My Points
Focus	Always stays focused on task	Stays focused on task most of the time	Stays focused some of the time	Rarely stays focused					
Helps	Helped a lot and supported group	Strong group member who tries hard	Group member who does what is required	Does not help out at all					
Duties	Performed all assigned duties	Performed most assigned duties	Performed some assigned duties	Performed no assigned duties					
Attitude	Always has a positive attitude	Usually has a positive attitude	Publicly critique the task and work of group members some of the time	Negative most of the time and publicly critique other members' work					